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A Weekly Summary of Current Science

EDITED BY WATSON DAVIS

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EDWIN E. SLOSSON, Director
WATSON DAVIS, Managing Editor



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MICROSCOPIC EARTHQUAKE STUDY TO HELP PREVENT DISASTERS

Studying earthquakes in California as with a microscope to learn their whims and so to help prevent such damage as that in San Francisco in 1906 and in Santa Barbara in 1925, is the program inaugurated in the region of Los Angeles by the Carnegie Institution of Washington and now being introduced by local business interests around San Francisco, according to Dr. Bailey Willis, professor emeritus of geology at Leland Stanford University, and president of the Seismological Society of America.

"Earthquake centers are located in belts," Prof. Willis told a representative of Science Service, "one belt surrounding the Pacific Ocean, and another extending across Southern Asia and the Mediterranean. Still another belt crosses the West Indies. The belts are related to zones of growing mountains, where there are marked differences in elevation, sometimes between mountainous regions and lowlands, and sometimes between the land and the bottom of the sea. These differences in level, however, are the effect, and not the cause, of earthquakes, because the forces which produce the quakes are those engaged in pushing up live mountain ranges.

"As a result of a world-wide earthquake survey, we now have maps of earthquake regions which for accuracy and completeness may be compared with the maps of the continents in the time of Queen Elizabeth, but we need much better maps, and to get them we must have closer surveys. For that purpose we have need of a new type of instrument of seismometer.

"In designing this new type, the experts of the Carnegie Institution have resorted to a pendulum which scarcely weighs an ounce and is attached to a tungsten steel wire as fine as a spider's web. It carries a small mirror which reflects a pencil of light and the latter draws the record on a moving photographic film. In size and weight the instrument is exceedingly strong, and yet it offers no large mass by which an earthquake could destroy it, as is the case with older designs.

"It has thus been made possible to record a microscopic earthquake, and we might well call the operation the study of earthquakes with a microscope. These microscopic earthquakes are called microtremors. They occur constantly in earthquake regions and frequently in other places, as on the Atlantic coast. Their frequency and intensity is a gauge of earthquake activity.

"When we know more about them, we shall be able to follow these minute elastic vibrations very much in the same way as the Weather Bureau now follows fluctuations of the barometer. We expect that in time we shall be able to tell from them the

approach of an earthquake 'storm', and thus may come nearer to forecasting quakes - something which is now impossible.

"With a view to making a local survey, the Carnegie Institution is establishing four stations in Southern California, located at Pasadena, Riverside, La Jolla and, probably, Catalina Island. The range of each station for microtremors is about 50 miles, and of course longer for heavier shocks. The four stations will therefore cover the whole of the coastal region of Southern California, and from their records we shall obtain a good knowledge of the distribution of earthquake activity. One of the instruments at Pasadena recorded 200 microtremors in its first twelve months of experimental operation.

"The example of the Carnegie Institution led to an active campaign for the installation of modern seismometers around San Francisco Bay, and funds have been raised by business men and corporations of the cities on the bay for that purpose. The central station will be located at Berkeley, at the University of California, which will also run a subsidiary station at the Lick Observatory on Mt. Hamilton. Stanford University will take care of a third, and the California Academy of Science in Golden Gate Park, of a fourth. The cost of these instruments, including the necessary earthquake-proof shelter, full equipment of seismometers and time recording apparatus, amounts to \$22,000. Their maintenance and the study of their records is assumed by the three institutions named.

"It is anticipated that we shall thus learn what the present earthquake activity is, and that we shall be able to locate it and to follow its variation as it increases toward the next severe shock.

"The installation of similar groups of instruments, not only in other parts of California, but around Boston, New York, St. Louis, New Orleans, and other great centers of population and property, is one of the things to which business men should give serious consideration, and toward which their contributions would constitute an investment in security."

WHO OWNS AMERICA'S PREHISTORIC REMAINS?

The Indians who roamed about prehistoric North America, carelessly crossing the boundary of one "state" of the future United States and going on into another "state" were making trouble for antiquarians of today, according to Neil M. Judd, curator of American archeology, of the National Museum.

Speaking at a meeting of anthropologists of the National Research Council, Mr. Judd reported that as a result of the wanderings of aboriginal tribes an archeologist who is studying the ruins of Indian settlements and the relics of pre-Columbian Indian civilizations often has to follow the trail from one locality to another. But crossing state borders is harder for the archeologist of today than it was for the Indian of prehistoric times, because of a growing disposition in some sections of the country to restrict archeological research to resident tax payers.

"There is one state which prohibits investigation of archeological sites by non-residents and forbids sale of local antiquities outside of that state," said Mr. Judd.

In that particular commonwealth commercial pot hunting has increased since passage of the law. Two other states have laws designed to prevent vandalism of prehistoric remains, but these laws may be utilized to prevent the researches of non-residents. Six other states have considered or are now considering similar legal restrictions.

"In most instances these laws were introduced with the idea that they would put a stop to irresponsible digging by untrained individuals. What the laws will actually do is prevent serious investigation by all competent students who happen to live outside the state borders, and encourage promiscuous relic hunting by local curio dealers and others seeking personal gain.

"Unless a nationalistic spirit is maintained it is quite possible that archeological research throughout a considerable portion of the United States will eventually be so circumscribed that established museums and educational institutions of international prestige can no longer engage in constructive field investigations."

Mr. Judd pointed out that the real object of American archeologists is to acquire all possible data concerning different groups of America's prehistoric population, so that the unwritten history of those groups may be better understood and recorded. This can only be done by careful observation at old ruins and dwelling sites and by painstaking study of pottery and other articles just as they are found in rubbish sites, abandoned rooms or burial grounds.

"This research is necessary if we are to understand the part these early tribes played in the history of America and of the human race, and it is work for specialists," said Mr. Judd. "Generally speaking, the prehistoric artifact exhumed by unskilled hands and thus separated from data perhaps equal in importance to the specimen itself must always remain a mere curiosity. Every mound, every ancient ruin or shell heap has its own peculiar problems. They must be worked out there, on the ground, and only a man trained in seeing under the surface of things can work them out.

"Prehistoric Indians had no thought of our present state boundaries, and it is both unethical and unscientific for residents of one state to say that those who chance to dwell in another may not cross their state borders in pursuit of data pertaining to migratory aboriginal peoples," Mr. Judd added.

"NEW STAR" IS IN DISTANT UNIVERSE

Flashing out from previous invisibility to the thirteenth magnitude, bright enough to be seen with a large telescope, a nova or "new star" in a spiral nebula has been discovered at the Heidelberg Observatory in Germany by Prof. Max Wolf, the director of the observatory, and his associate, Dr. K. Reinmuth. Word of this discovery has just been received by the Harvard College Observatory from Prof. Elis Stromgren, director of the Central Astronomical Bureau at Copenhagen, Denmark.

The spiral nebula in which the nova has appeared has no name, but is known as Messier 61 after its number in Messier's catalog of nebulae and star clusters. It is also known as N. G. C. 4303 after its number in the New General Catalog of such

objects, and is located in the constellation of Virgo, the Virgin, which is directly south about nine o'clock in evenings toward the end of May.

While novae, or "new stars", which, from previous invisibility or obscurity, suddenly become more brilliant, are not especially rare, they generally appear in the Milky Way. As our system of stars, or "galaxy", is approximately the shape of a grindstone, with the sun and its accompanying planets located near the center, when we look in the direction of the grindstone's diameter we see a great mass of stars which form the Milky Way. Novae which appear in the Milky Way, therefore, are in the same system of stars of which the sun is a part.

The spiral nebulae, of which many thousands are seen in all parts of the sky, except in the region of the Milky Way, where the thick mass of stars obscures them, have been found to be other galaxies, or "universes", similar to ours, but outside its limits, by Dr. Edwin P. Hubble of the Mt. Wilson Observatory in California. In a spiral nebula in the constellation of Andromeda, Dr. Hubble has found more than fifty such novae by studying photographs made with the 100 inch telescope at Mt. Wilson. By comparing the average brightness of these novae with the average of those which appear in the Milky Way, he has determined the distance of the Andromeda nebula, which is about a million light years. A light year is about six trillion miles - the distance that a beam of light, which travels fast enough to go from Boston to San Francisco in a seventy-fifth of a second, will travel in a year.

According to the Harvard College Observatory, no new stars have ever been observed before in Messier 61, though they have been seen in a few other spirals. The brightness of the one discovered at Heidelberg, however, is much fainter than the average of those which have been discovered in the Milky Way, so that it is probably as distant as the Andromeda nebula. The outburst of the star, therefore, must have taken place at least a million years ago, though the news of it, borne on the wings of light, has just reached the earth, and since it could be seen at such a vast distance, it must have really been exceedingly bright.

NEW PLACE FOR ATTACHING TAXI METER WINS IN TEST

A new method of attaching a taximeter to a taxicab and how it proved satisfactory in a seven months' test was described by Capt. George F. Austin, scaler of weights and measures of Detroit, at a recent meeting of the National Conference of Weights and Measures.

By connecting the taximeter to the transmission drive shaft of a cab instead of the usual attachment at the front wheel, Detroit taxicab companies have saved hundreds of dollars in the past six months, Mr. Austin told the conference.

The usual objection to this rear wheel type of attachment, he explained, has been that on slippery or snowy streets the rear wheels of a car are apt to spin, and the passenger would be required to pay for the imaginary distance covered by the slipping wheels. It was shown, however, that a wheel would have to slip what would amount to 422 complete revolutions before the slippage would register a ten cent charge on the taxi meter, according to Detroit taxi rates.

There have been no complaints of overcharging since the new method was tried in Detroit, Mr. Austin said, although the streets of the city were icy for almost three months of the winter.

EGGS BY THE POUND POPULAR, SAYS OREGON WEIGHTS EXPERT

A hen's life is just one thing after another. Take Oregon now. It isn't enough for a hen in Oregon to turn out her quota of eggs per year, but she has to lay eggs weighing at least one and five-sixths of an ounce, if she wants to come up to the standard set in the recent state egg law.

All because Oregon dealers are rapidly abandoning the old American tradition of selling eggs by the dozen and are selling eggs by the pound.

How this innovation is working in the state and how it is becoming popular - with the dealers if not with the hens - was described at the recent meeting of the National Conference of Weights and Measures, by William A. Dalziel, deputy state sealer of weights and measures of Oregon.

Mr. Dalziel exhibited some of the types of weighing devices which have come into use for weighing eggs to determine their grade. Some of the devices being used are not accurate, he declared. He urged that, since the practice of selling eggs by weight is spreading steadily, the devices used for grading them should be standardized and placed under the weights and measures laws.

NEW STRUCTURAL MATERIALS TO MAKE AIRCRAFT SAFER

Structural material, and not engines or machine design, is the big problem today in aircraft development. Such is the experience of J. H. Kindelberger, engineer in charge of United States mail and military airplane construction in Santa Monica, Calif.

The imminent failure of the spruce lumber supply normally available from Oregon and Washington means that the all-metal plane is now the only real prospect of the future. Strangely, no material has yet been found, even in the domain of heat-treated steel and light alloys, which is equivalent, pound for pound, to straight-grained clear spruce for the main skeletal support of an airplane. Millions of feet of spruce in fact the major stocks of the northwest mills, have recently been rejected, however, by airplane lumber scouts. The few thousand feet of lumber deemed suitable for the work will be utterly inadequate in the face of the extensive development of the air service now in prospect. Thorough and most extensive research is now progressing with alloys of aluminum, copper and manganese.

Sheet metal stampings and seamless tubes of aluminum alloys are proving successful for cross braces and minor support members, also for flooring and sheathing of various sorts. Castings, heretofore considered unsafe under the strain of air service, are being made of more ductile metal, and will be available.

In naval practice the aluminum alloys frequently come to grief, due to the great chemical activity of aluminum when exposed to sea water. Atmospheric oxygen, water and salt transform an aluminum hydroplane skeleton into a mass of white powder. This oxidized powder may still retain its original form on account of the dried varnish shell about it, and accordingly be a source of deceptive danger. Inasmuch as resistant metals are all relatively heavy, little hope is offered of an alloy that will stand actual contact with the sea. New varnishes are in prospect, however, to meet the situation with light-metal alloys.

HEAT-RESISTING BACTERIA EVOLVED IN LABORATORY

The bacteria produced by selective breeding may display as scientifically startling qualities as any white mouse or guinea pig of hand (or laboratory) picked ancestry. Dr. C. A. Magoon of the Bureau of Plant Industry in the U. S. Department of Agriculture has recently announced through the Journal of Infectious Diseases that he has been able by a process of selection to produce a strain of bacterial spores twenty-five times as resistant to heat as the original spores with which he started his experiments.

It is a phenomenon familiar to scientists that in a given strain of bacteria a few hard-boiled individual spores are much more resistant to heat than others. A spore is a heat and cold resisting form developed by bacteria that in many ways may be compared to the seed of higher plants.

Since a large amount of food spoilage and sometimes food poisoning is caused by the bacteria that develop from heat resistant spores it is essential that as much as possible be learned of the reasons for this variation in heat resistance and the factors influencing it.

Dr. Magoon began his experiments with spores of one of the common soil bacilli that had survived seven minutes in an oil bath at the temperature of boiling water. Breeding from the most resistant spores each time, he then proceeded to produce several generations the spores from each of which would stand a longer period of boiling without being killed than the preceding ones. Their period of germination was found to vary considerably, some starting growth within twenty-four hours while others required more than twelve days.

Dr. Magoon says in conclusion: "Preliminary studies only have been made to determine the basis for these differences in thermal resistance among spores and the evidence in hand is insufficient in amount to warrant definite conclusions. More information upon this important subject is greatly needed, for until more is known of the reasons for these differences, satisfactory and reliable methods of spore destruction cannot be developed, and the technology of food preservation will continue to be subject to the laws of chance".

ADVANCES IN INDOOR LIGHTING PRESERVE EYESIGHT, SAYS EXPERT

A human being of today makes his eyes work harder than eyes have ever had to work in the history of civilization. But if indoor lighting is sufficiently powerful and properly shaded, the amount of defective vision, which is now so great, could be cut down materially.

How this situation is being worked out in the American home was described by Dr. M. Luckiesh, president of the Illuminating Engineering Society, who spoke before the National Electric Light Association, at its recent session.

Effective artificial light has been suddenly given to a civilization which for centuries had been used to feeble flickering lamps, Dr. Luckiesh pointed out. "Biologically speaking, we just came indoors yesterday." He added, however, that though the average American home is the best lighted in the world, it is not adequately lighted and "improper use of light is generally prevalent, thus contributing to waste through eye injury, discomfort, cheerlessness, and inefficiency."

An ideal plan for correct use of electric lighting in the home was described by Dr. Luckiesh, who said that a six room house should have 11 convenience outlets, 11 ceiling fixtures, 8 utilitarian brackets, and 8 portable lamps. Compared with conditions now found in the average home, this would mean trampling the number of lighting appliances, with the exception of ceiling fixtures. The number of ceiling fixtures in the average home is now 8. Dr. Luckiesh declared that "one-third of ceiling fixtures now in homes are absolutely obsolete."

Use of higher powered lamps, properly shaded, was urged by this lighting expert.

ANTI-EVOLUTION LAW IS PROPOSED IN LOUISIANA

Evolution is attacked in Louisiana by a bill, similar to the Tennessee and Mississippi laws, which has been introduced in the State House of Representatives by Charles H. Hudson of Union Parish.

The author of the bill states that he believes in evolution so far as it applies to plant breeding and the improvement of livestock, but is of the opinion that the teaching of the doctrine in the state institutions of higher learning is subversive of religion and should therefore be stopped.

In the opinion of newspaper men and other observers in Baton Rouge and New Orleans, the bill has little chance of passage. It has been relegated to committee, where it may be left to die, in spite of efforts to get it to the floor of the House. Anti-evolution sentiment has the support of the Ku Klux Klan, it is stated, and this will earn the bill the opposition of the strong Catholic element in the state, as well as of the anti-Klan sections of the Protestant population.

ADOBE BRICKS YIELD CALIFORNIA HISTORY

Reading history from mud bricks is usually thought of only in connection with ancient Babylon, but Miss Margaret Kelly of the U. S. Department of Agriculture and Prof. G. W. Hendry of the College of Agriculture of the University of California have made the adobe bricks of the old Franciscan missions in California give up secrets of the past, relating to the introduction of agriculture into California.

The early Spanish missionaries introduced practically all of the major crop plants now cultivated south of San Francisco Bay, but since they were intensely busy men, with thousands of Indians to look after and too few of their own numbers for the work, they did not keep full written records of all their activities. Consequently the dates of introduction of most of the white man's crops have been lost.

But in the making of adobe bricks, barnyard and stable refuse is mixed with mud, and in this way the seeds and stubble of many kinds of plants were worked into the walls of the buildings and thus preserved. By dissolving the unbaked bricks in water Miss Kelly and Prof. Hendry were able to recover and identify such seeds. Since the dates of erection of the missions are well known, the dates of the introduction of the crops represented by the adobe-embedded seeds could be at least approximately determined.

While the data obtained from the California missions is valuable, it is believed that the older Jesuit and Franciscan establishments in Mexico will add to the total fund. There are thirty-three missions in Mexico, most of them abandoned. The oldest is the Jesuit mission at Loreto, established in 1690. Here Miss Kelly and Prof. Hendry hope to obtain information of the highest value.

AID TO BEAUTY HELPS SEED EXPERIMENTERS

Hydrogen peroxide, popular as a mouth wash and employed in the mysteries of the "beauty shoppes", has found a more prosaic but economically important use in agricultural science. R. H. Walker and L. W. Erdman, of Iowa State College, have found that solutions of 10 and 15 per cent. concentration will free seeds of clover, peas, soybean and other legumes of all bacterial and other microbic life at ordinary room temperatures in about thirty minutes. These concentrations are from three to five times the strength of the peroxide solutions ordinarily sold by drug stores, which average 3 or 4 per cent. Solutions as low as 5^{per} cent., the experimenters found, were not effective in ridding the seeds of microscopic life, while 30 per cent. solutions injured the seeds.

The Italian Fascisti have declared war on birth control, which is regarded as a cause of low birth rates in some Italian provinces.

STATE PARKS MOVEMENT GROWS

Representatives of the forty-three states that now have state parks, forests, or similar natural areas open to their people for educational and recreational purposes will meet at Hot Springs, Arkansas, for their sixth national conference, June 14 to 16. John Barton Payne, chairman of the conference, states that since the movement was organized on a national basis at Des Moines, Iowa, in 1921, the number of states having parks has doubled, and the number of preserves in such systems has shown even greater growth, so that the area now included is nearly seven million acres. The goal of the movement is "a state park every hundred miles."

"DEWBOWS" FORMED AT NIGHT BY MOONLIGHT

"Dewbows", similar to rainbows, but with droplets of dew deposited on grass taking the place of the minute particles of water suspended in the air, and with the light of the moon serving instead of the sun, have been observed on the campus of Rice Institute, Maurice Ewing says in a note in a recent issue of "Science".

"The dewbows appeared as faintly defined streaks of white light tracing ellipses in the grass", he says. They were only seen after freshly formed dew, and not after a shower, because the drops left by rain, or by dew which has been standing for several hours, are so large that they are not practically perfect spheres, as are the smaller ones. Though each of the larger drops refracts the light in the same way as the smaller ones, the fact that they are of different shapes makes the refracted beams from each go in different directions, and so the bow is not seen, which results from the cumulative effect of a number of different droplets.

TABLOID BOOK REVIEW

THE BACTERIOPHAGE AND ITS BEHAVIOR. By F. d'Herelle. Baltimore. Williams and Wilkins Co. 1926. 629 pp. \$8.00.

Dr. d'Herelle here gives a complete account of the bacteriophage, that strange, invisible "principle" that devours bacteria, discovered by the author some ten years ago. The book is written for scientists but the manner of presentation is so straightforward and incisive and the resumes of the chapters aid so admirably in making clear the author's point in regard to each matter he discusses, that the lay reader need have no hesitation in turning to the book for authoritative information.

Dr. d'Herelle is entirely convinced of the living, organic character of the bacteriophage and argues at length in defense of this view against the theory that only a chemical phenomenon is involved. He discusses the distribution of the bacteriophage, the reaction between it and the bacteria it parasitizes and its behavior under various conditions. He also discusses the use of the bacteriophage in combatting certain infectious diseases and he suggests its purely theoretical significance in relation to the study of the origin of life and the process of evolution.

THE UNIVERSE OF STARS; edited by Harlow Shapley and Cecilia H. Payne. Cambridge Mass., 1926; The Harvard College Observatory, 205 pp., \$2.00.

Though radio talks on science in its various branches, including astronomy, have been given since the first days of broadcasting, as in the series given in Washington under the auspices of Science Service and the National Research Council, it was not until the fall of 1925 that any effort was made to give a comprehensive course of talks on general descriptive astronomy via the air. This series was given by members of the staff of the Harvard College Observatory through station WEEI of Boston, and now that they have been concluded, they are published in this attractive form.

Thirty-two articles make up the book, ranging in content from the use of a telescope to measuring the universe and the possibility of life in other worlds. As the staff of the Harvard College Observatory includes some of the best known names in astronomy, such as Dr. Shapley, the director, Miss Annie J. Cannon, the leading authority on stellar spectra, Dr. S. I. Bailey, Miss Payne, and others, the accuracy of the book is unquestioned. A number of well selected photographs, depicting various observatories and their work, are an added attraction, and help to make the book one to be heartily recommended to the general reader.

THE ENDOCRINE ORGANS. Part II By Sir E. Sharpey-Schafer. London: Longmans, Green & Co. 1926. \$7.00.

Knowledge of the functions of these chemical power-houses of our bodies is increasing so rapidly that every time a really authentic book is published it automatically makes all previous works out-of-date and becomes a necessity for all physiological investigators, teachers and physicians. This new edition of Sharpey-Schafer exhausts the subject, as known up to the date of publication.

A tribe of bushmen in southwest Africa is so primitive that its only language is said to be a series of clicks of the tongue.

Country seed dealers who once sold only half a dozen kinds of garden seed now carry 20 or more kinds that contain the valuable vitamins.

Colored silks fade as much from 34 hours of exposure to sunlight as from 100 hours exposure to electric incandescent light of comparable brightness.
